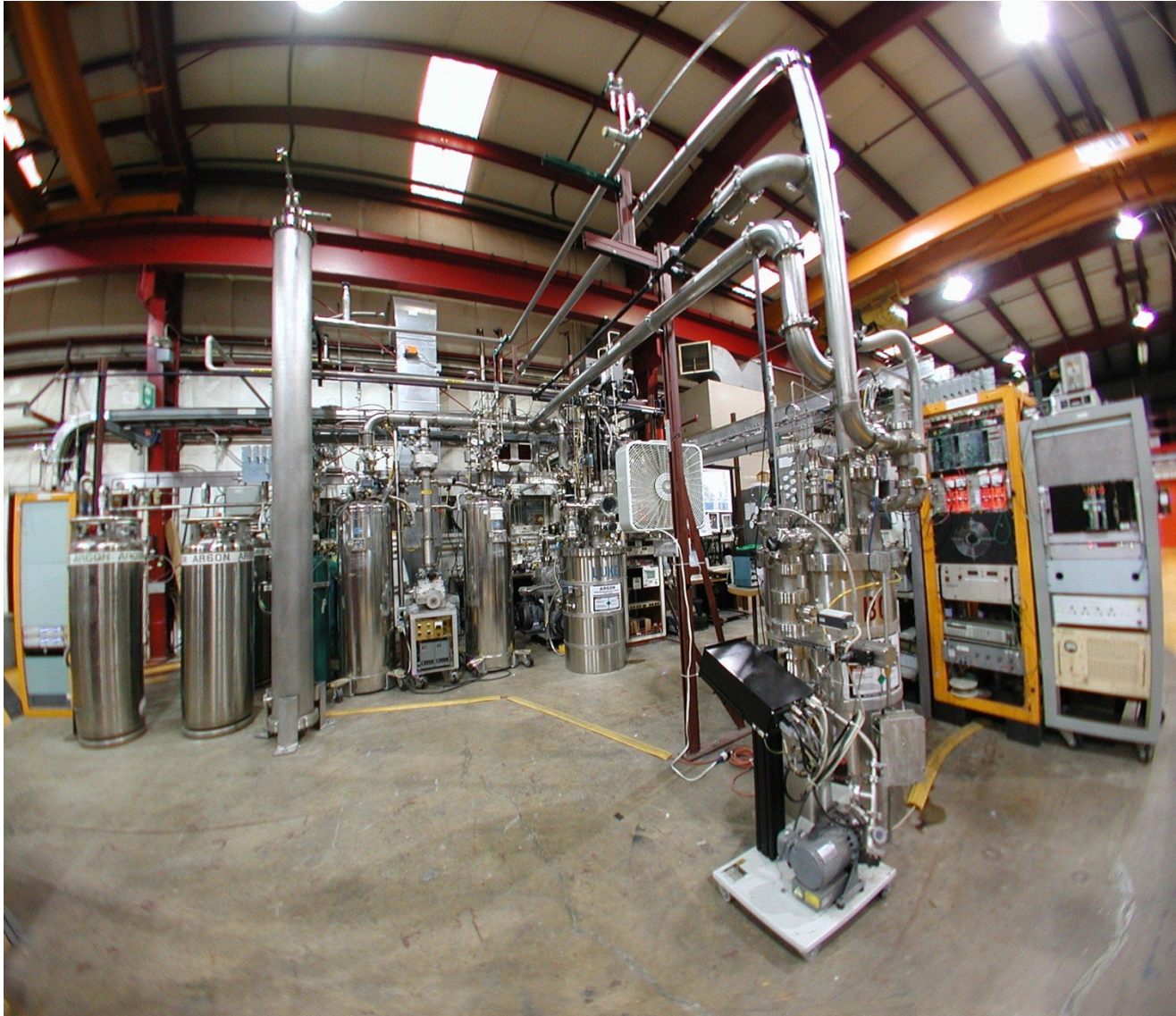


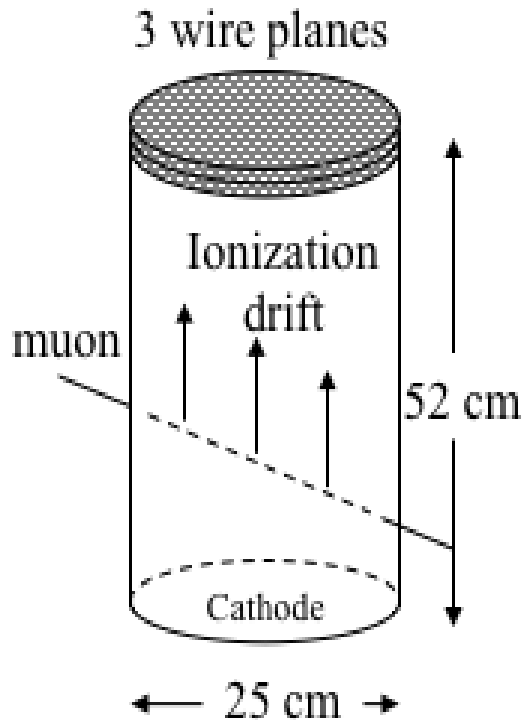
LAPD Phase 2

S. Pordes, B. Rebel, T. Yang,
M. Stancari, S. Lockwitz, H. Jostlein

PAB May 2011



(Short) Bo TPC



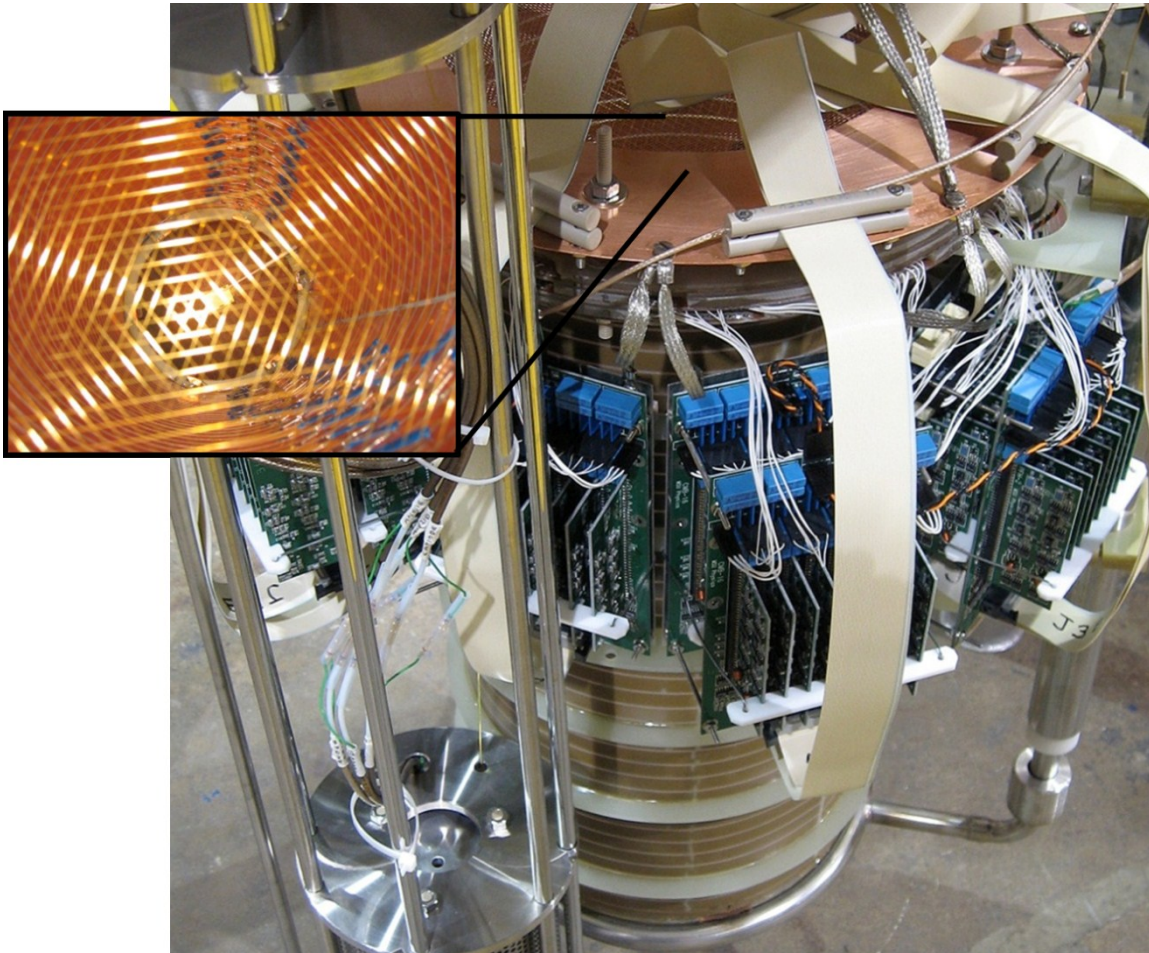
- 50 L
- 3 wire planes, 60 degree rotation
- 4.7 mm wire spacing, 50 wires per plane
- Separation between wire planes 7 mm
- 0-3 kV cathode

Bo Cryostat & TPC



- Used in 2009 to develop ArgoNeut electronics and DAQ at the Proton Assembly Building (PAB) at Fermilab
- In 2011, warm amplifiers replaced with cold amplifiers (MSU)

Bo TPC with MSU cold electronics

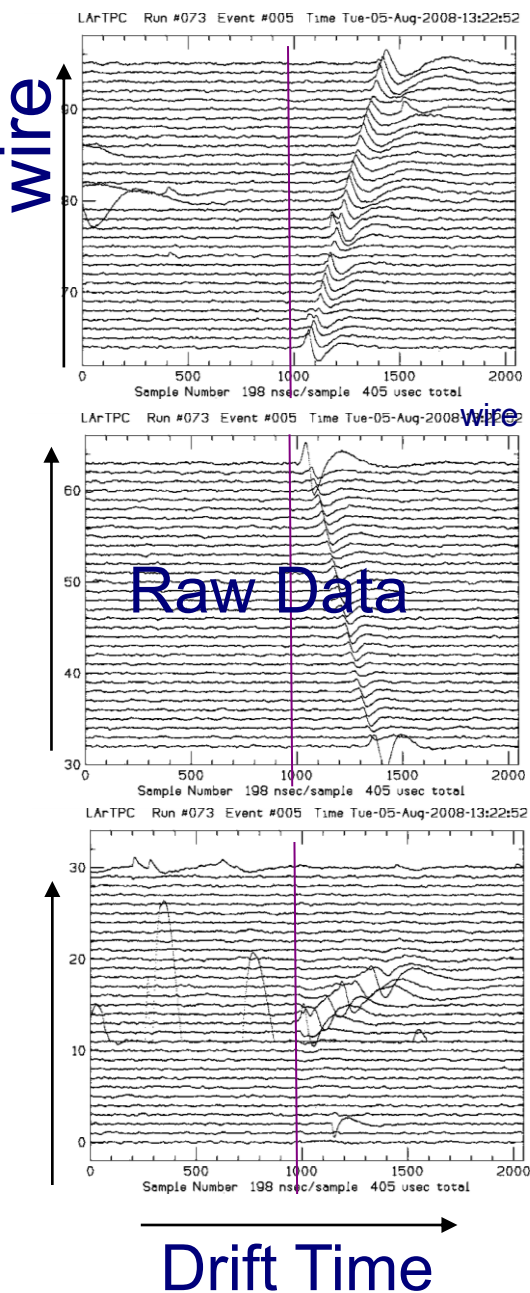


- First cold CMOS electronics in a LArTPC
- Next step is cold ASIC

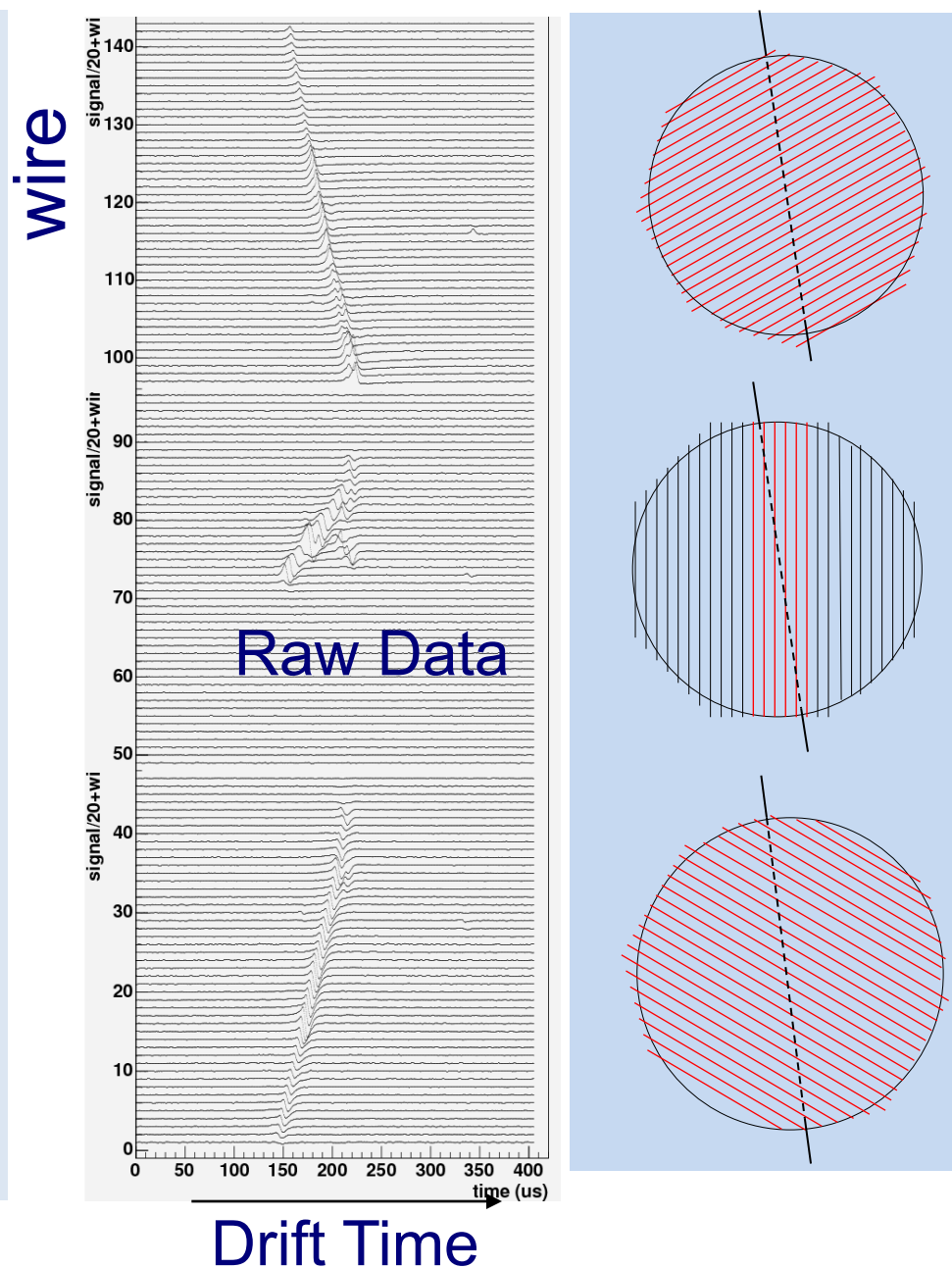
Cold electronics: 2011 cosmic runs

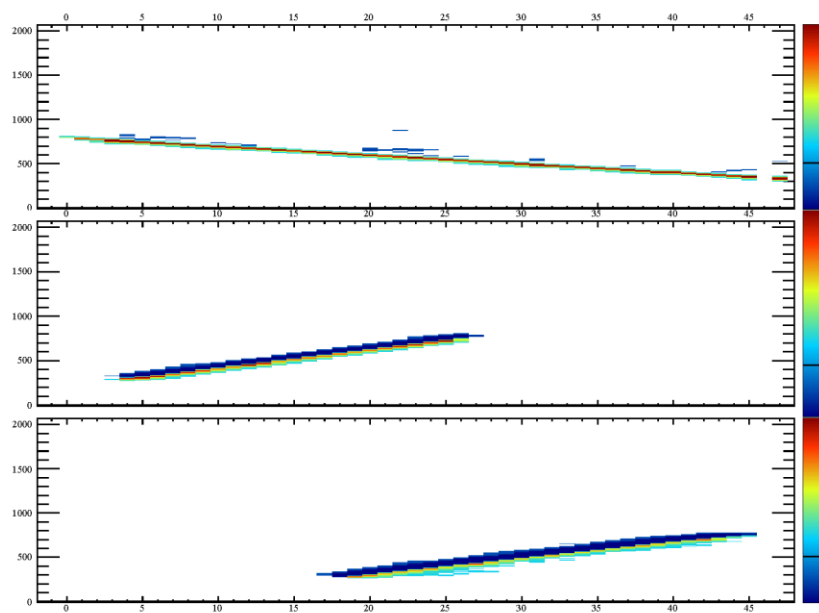
- Trigger on single pair of scintillator paddles outside cryostat
- Crude reconstruction of single straight tracks in stand-alone (not LArSoft) code to evaluate S/N
- LArSoft has geometry, event display works nicely, hit reconstruction currently crashes (event display crashes at the moment as well)

Warm amps S/N = 15

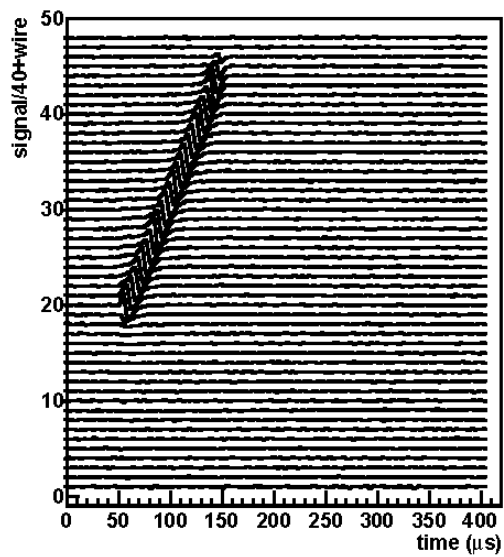


Amps in liquid S/N >30

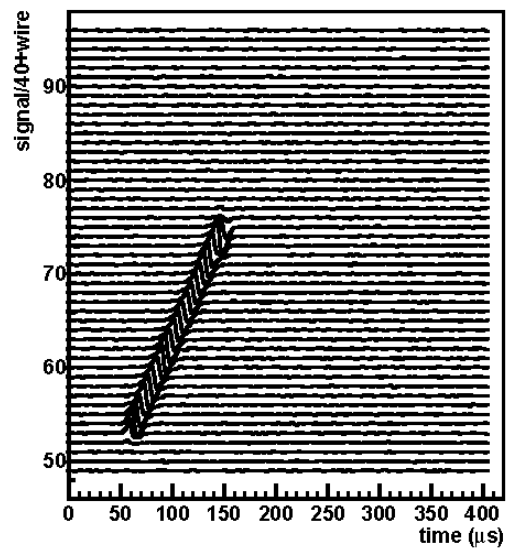




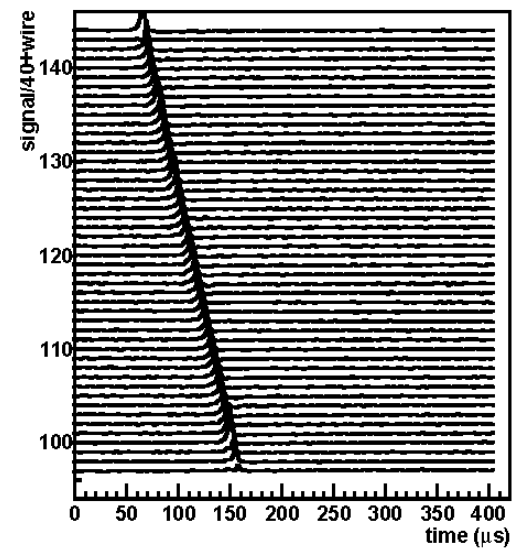
A plane

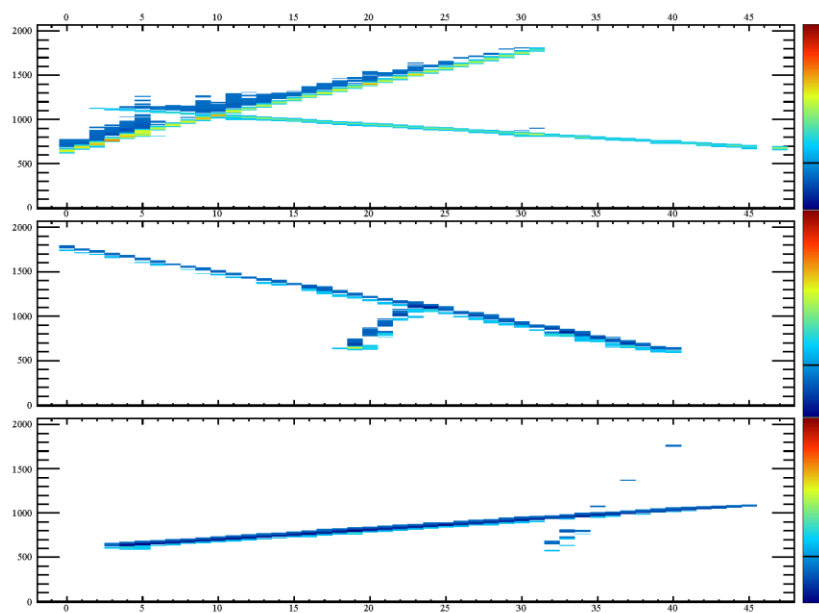


B plane

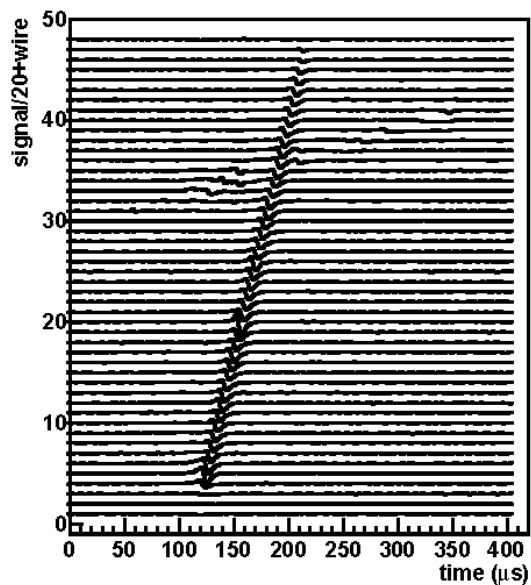


C plane

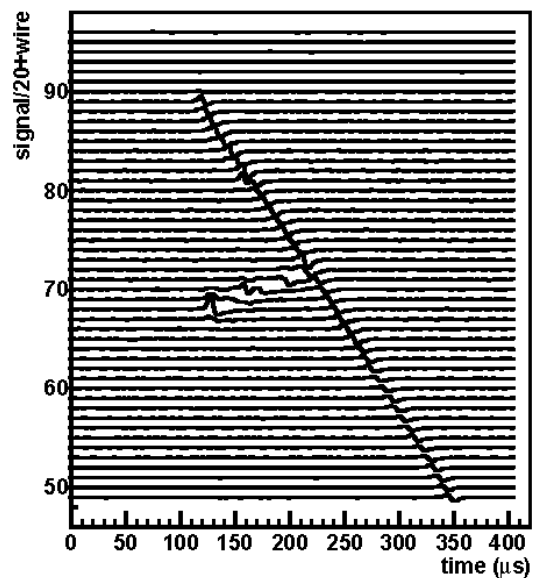




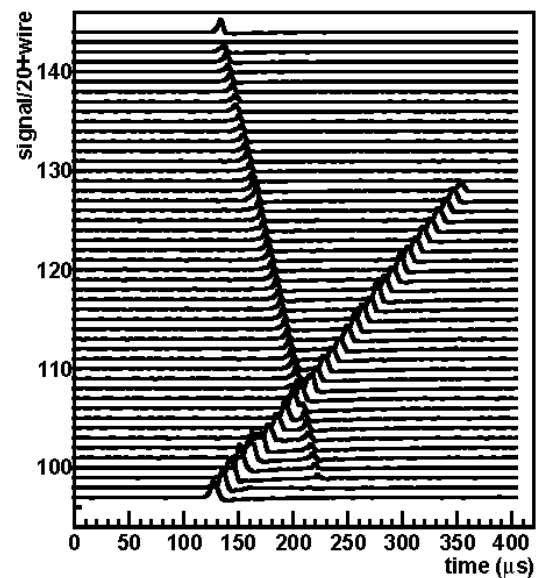
A plane



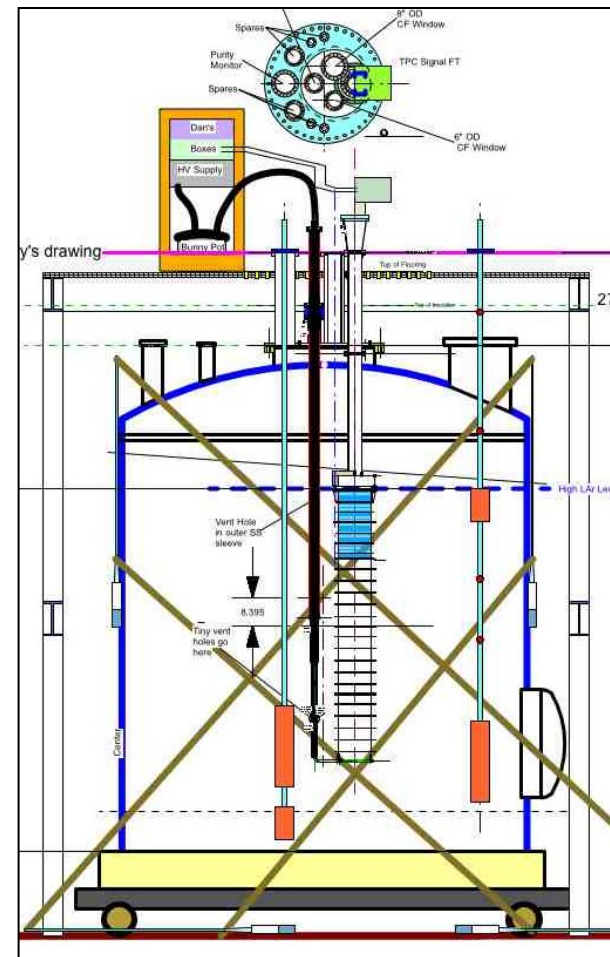
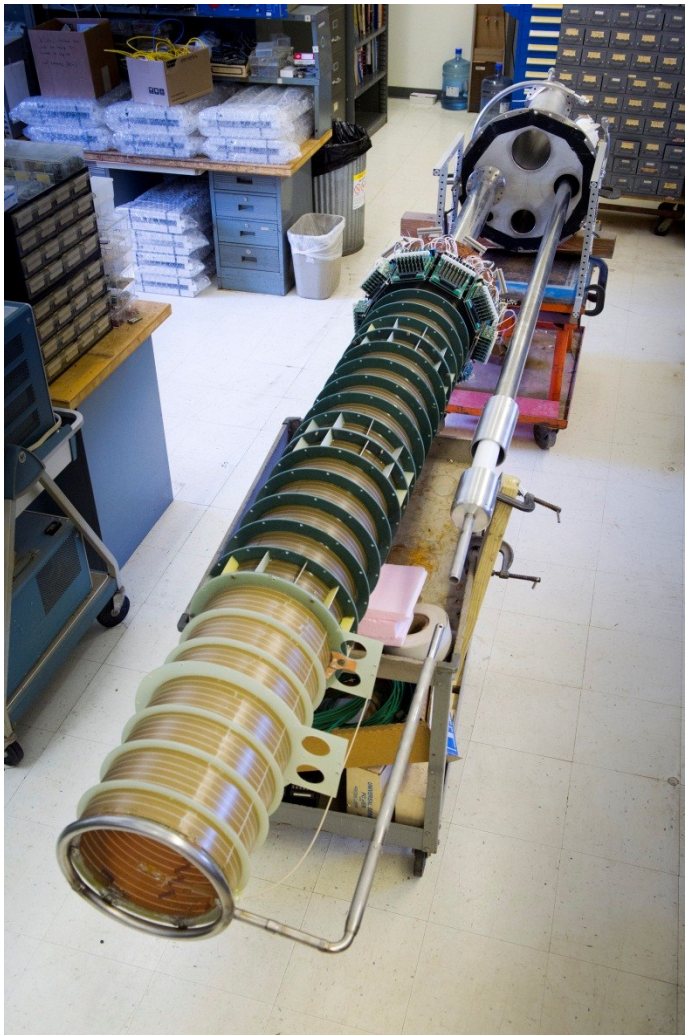
B plane



C plane

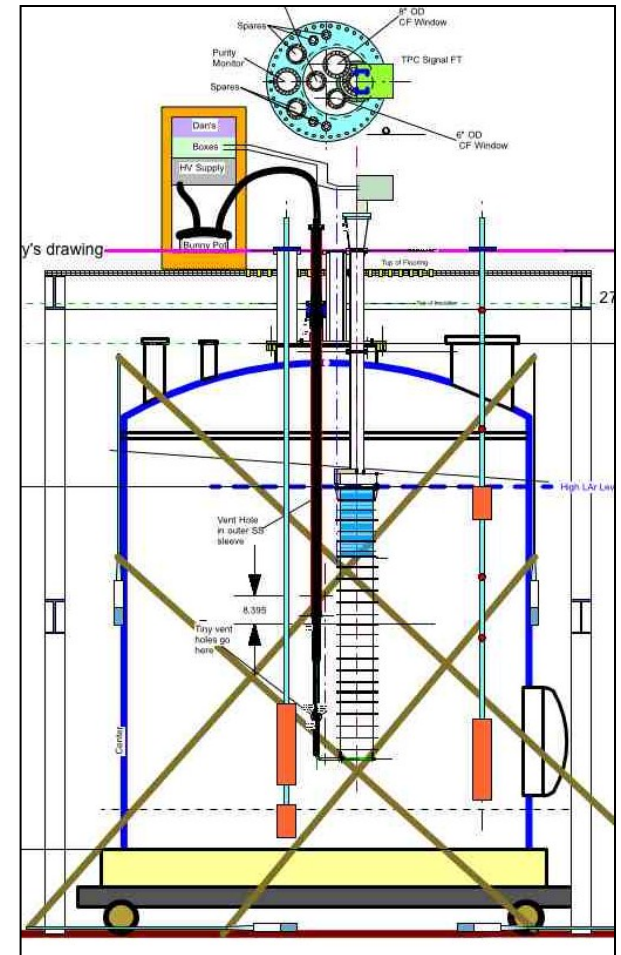


“Long Bo” 2m long, ≤ 150 kV

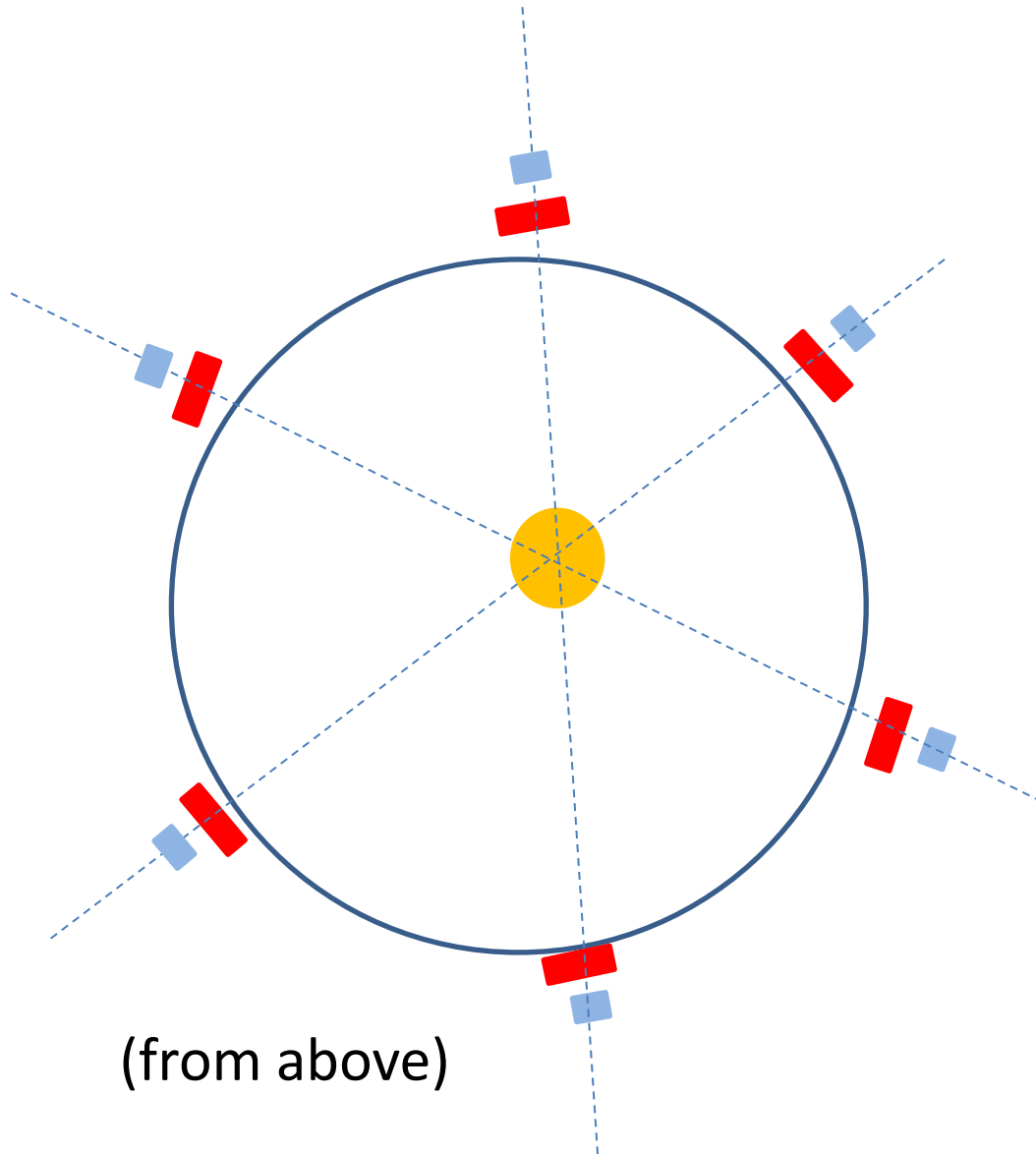


Cosmic Ray Trigger

- “Pairs” of counters on opposite sides of the tank. (Hi-Lo to get muons traversing TPC)
- 2 pairs on each of 3 axes
- Muon direction perpendicular to wires
- Total rate $\sim 1\text{-}2\text{ Hz}$

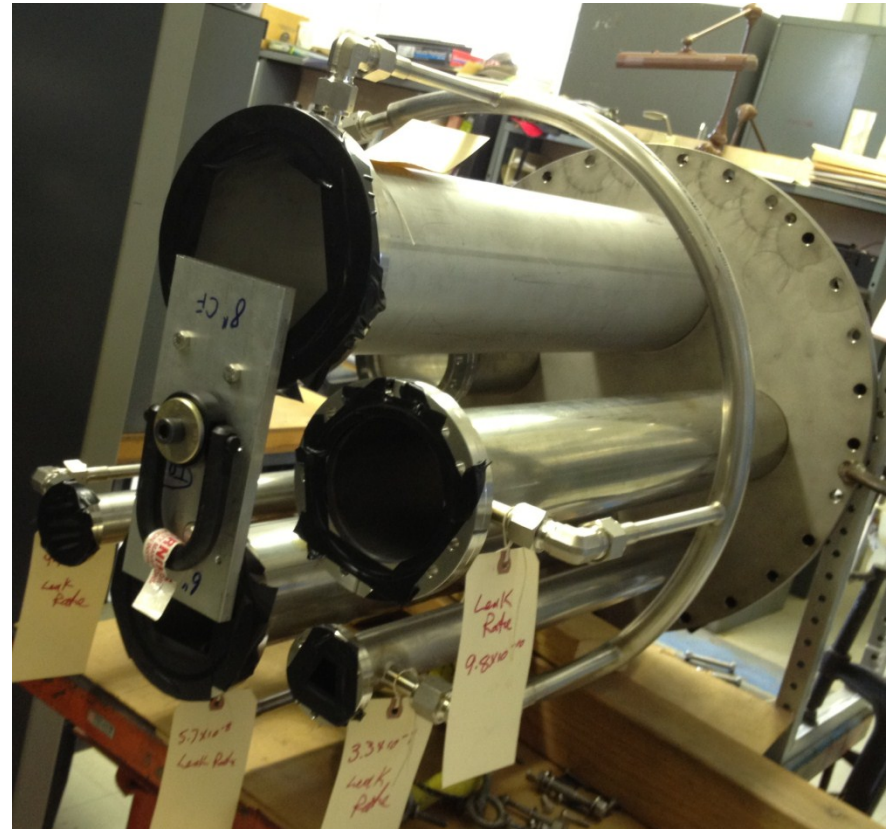


Extra Counters

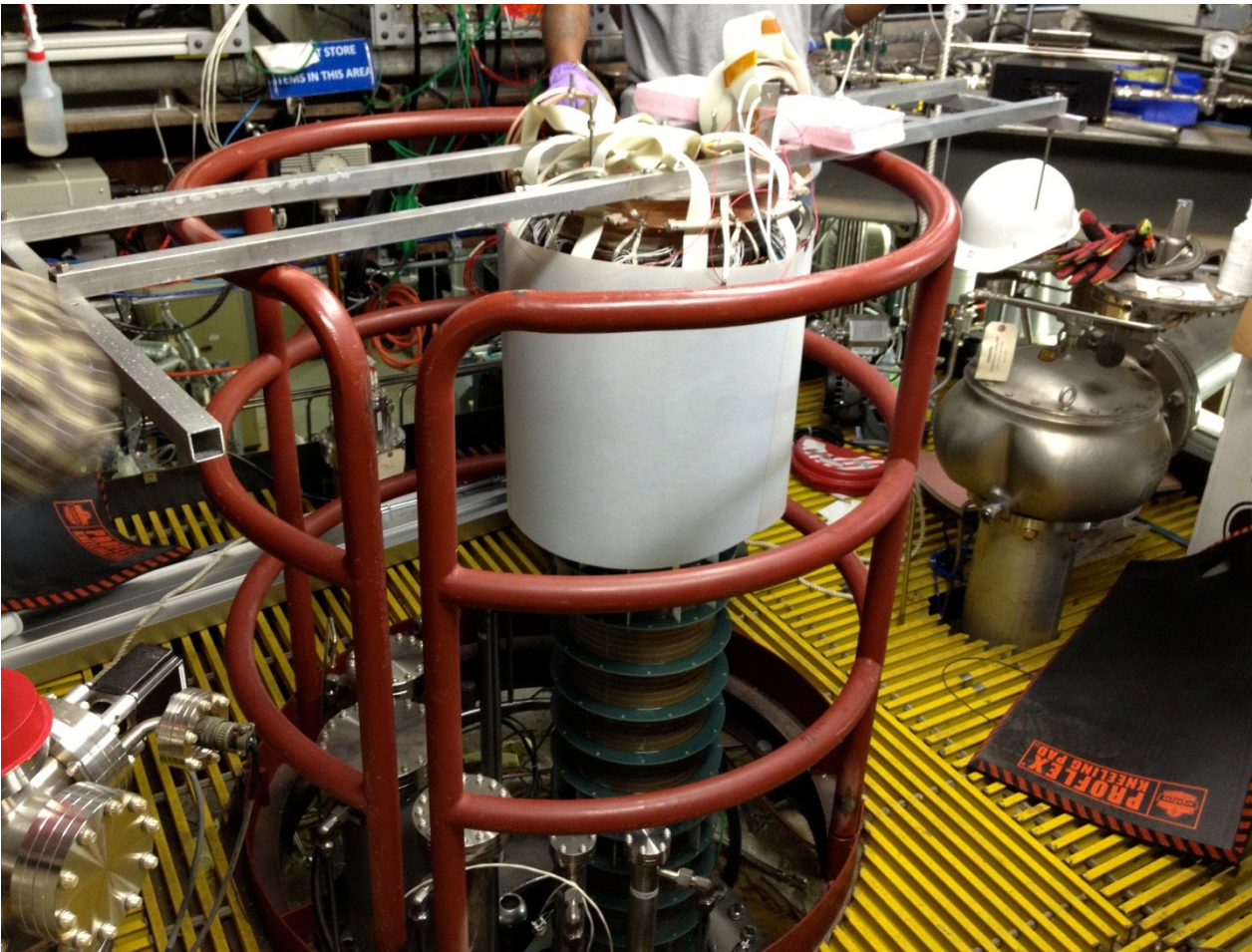


- NOT to scale, or even close!
- Possible to rotate red counters 30 deg. and have 6 axes for triggering

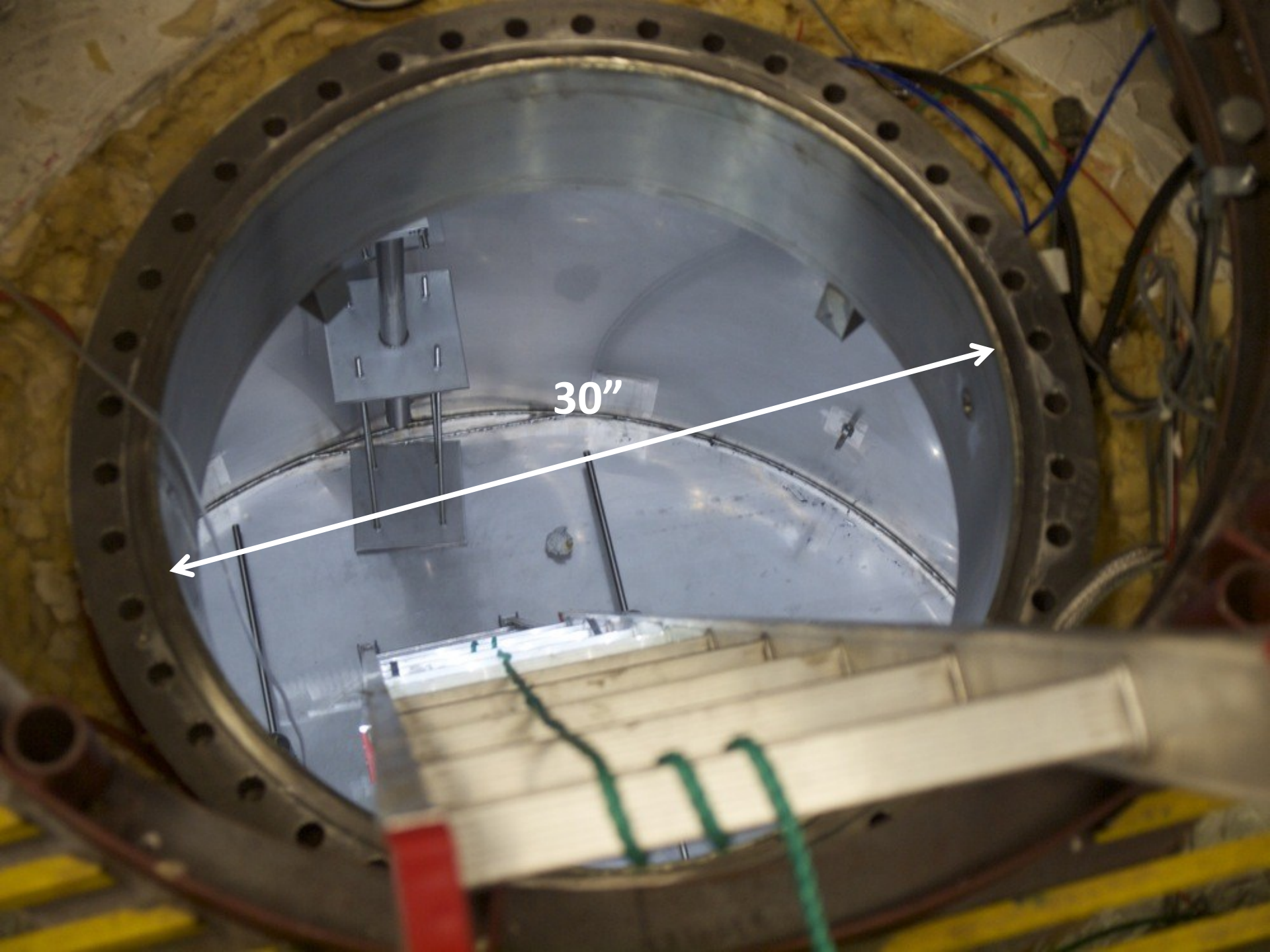
Flanges



Reality

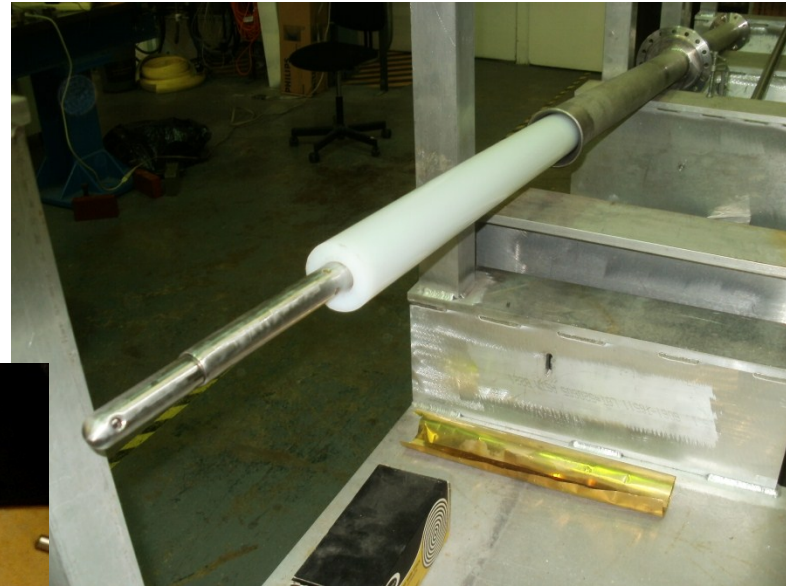
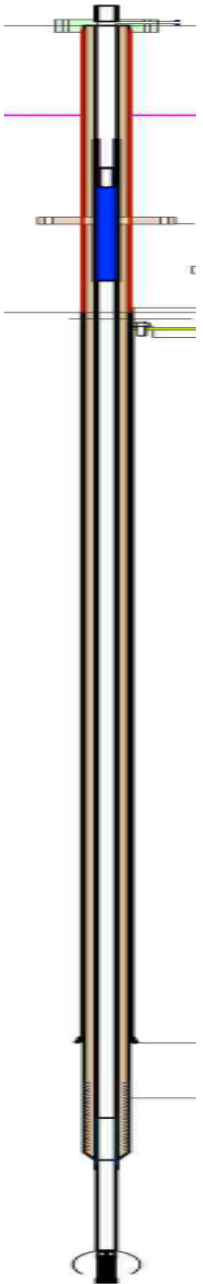


- Limited vertical clearance from tank to roof
- Very difficult to add anything to the tank without removing TPC



HV Feedthrough

H. Jostlein and S. Lockwitz



Tested to 150 kV

LAPD Phase 2 program

- 150 kV feedthrough voltage already achieved (nominal operation at 100 kV for 500 V/cm)
- Measure purity with CR muon tracks
- Fully characterize filter sizing and material performance
- Study the effect of varying the recirculation rate on the drift lifetime
- Perform studies of how quickly lifetimes can be recovered from (intentional) poisoning of the Argon

Open questions

- Can we measure purity better with the TPC than the purity monitors?
- Can we see dispersion effects ?
- Can we see the effect of positive ion build up?

Potential for LBNE R&D with LAPD

- Existing setup with CR trigger and straight muon reconstruction software already in place
- BUT very difficult to add anything inside cryostat without removing TPC.
- Can be used while the 35 ton is being modified
- Much easier to access TPC for small modifications
 - light detector development
 - electronics tests
 - calibration system development

Just to show off

